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WHAT IS COMMON WHEAT RUST?

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THE term rust is applied to the orange-colored or ferruginous powder, which frequently appears on the surface of the leaves and stems of wheat and other cereals some time preceding harvest. The powder, which gives occasion for the name, constitutes the reproductive part of a parasitic fungus, growing inside the grain plant. It is, however, not the only reproductive form which the fungus has, for after a time a less prominent set of spores are formed, blackish in color, persistent, and consequently not forming a powder.

In this country, and in Australia, the relative amount of time in each season during which the two kinds of spores are produced, is much greater for the red rust than for the black rust, on which account the latter is little observed or mentioned by the cultivator. Just the reverse is true in England—the red rust is of brief duration and inconspicuous, while the black stage comes on early and lasts till harvest. This difference in growth explains the difference in the application of common names, for in England, especially in the northern part, the term "rust" is little used, but the farmer talks of "mildew" or "brand".

The English mildew has been much studied and written about. Its botanical name is *Puccinia graminis*. It not only grows on wheat, but also on oats, barley, rye, and many grasses, both wild and cultivated, wherever found throughout the world. In both the popular and scientific accounts of wheat rust in America, there appear to have hitherto been no doubts entertained that the species doing the damage was *Puccinia graminis*, the same as the mildew of England.

During a study of the condition of rust on winter wheat in the winter season, made by Mr. H. L. Bolley in 1888–9, under my direction, the fact that the shape and appearance of the rust spores did not correspond exactly with those of *P. graminis*, but more nearly with those of *P. rubigo-vera*, attracted attention. When the black-spore (teleutospore) stage began to appear in June of the present year (1889), all doubts regarding the identity of the then prevailing rust with *Puccinia rubigo-vera* were at an end. The presence of this species did not, however, seem particularly surprising, as it has been known for some

time that the early rust in England is this same species, and although occurring every year, is thought to do little damage to the crop. As the time passed on, however, the whole wheat crop became thoroughly rusted with practically the one species. By careful search, the other kind could be found on isolated plants, but it had no appreciable part in the injury done the crop.

Upon discovering this fact, other fields in the vicinity were examined, with like results, and inquiries were set afoot to ascertain if the same was true elsewhere. Specimens and information received from different parts of Indiana, as well as from Iowa and some other States, clearly showed that, so far as the present season is concerned, the prevailing wheat rust for the Mississippi valley was *Puccinia rubigo-vera*. Whether this is true or not for other years, and for other parts of the country, I have no adequate data for forming a substantial opinion, but I am inclined to think so.

There is more in this discovery than that two species of rusts have been confounded. If the common injurious wheat rust of this country is not *Puccinia graminis*, then the question of the supposed harmful influence of barberry bushes in connection with rust assumes a different aspect than heretofore. The framers of the famous last-century barberry laws of Massachusetts may, after all, have been at fault, and have had no better reason for their action than the erroneous assumption that because barberry bushes in England increased the rust on wheat in their immediate vicinity, therefore the exclusion of barberry bushes from this country would render what wheat rust occurred quite harmless. Were this true, the farmers of the great wheat-growing region of the Northwest ought to be strangers to the pest. The fact, that although barberry bushes are practically unknown in that section, yet wheat rust is prevalent and destructive, has often been used as an argument against the belief that the rust on wheat and on barberry have any genetic connection. But their intimate relationship, if by wheat rust we mean *Puccinia graminis*, has been repeatedly demonstrated, by sowing the spores from the one upon the other, and is beyond all reasonable dispute. The mistake has apparently been made in assuming that all wheat rust is of the one kind, *Puccinia graminis*.

The *Puccinia rubigo-vera* of England, as is well known, is associated with the rust on blue-weed and other Borragineous plants, but it yet remains to be ascertained whether the rust that goes under that name in this country is identical with it, and, if so, whether it is also in any wise dependent upon introduced Borragineous weeds or upon native plants for its invigoration and continued existence, a matter of practical as well as of scientific importance.